

**WHAT IS CLAIMED IS:**

1. A multi-wavelength light source unit for use in an optical communication system, comprising:

a demultiplexer having an input port to receive a multiplexed light signal and a  
5 plurality of output ports for demultiplexing the multiplexed light signal into a plurality of lights having different wavelengths, so that the respective demultiplexed light with a predetermined wavelength are output from the output ports;

a multiplexer having a plurality of input ports nd to receive the demultiplexed lights, and an output port, for multiplexing the demultiplexed lights into the multiplexed  
10 light signal, so that the multiplexed light signal is output from the output port of the multiplexer, the plurality of input ports of the multiplexer being respectively port-to-port connectable to each one of the plurality of output ports of the demultiplexer;

a plurality of semiconductor optical amplifiers each disposed between the output ports of the demultiplexer and the input ports of the multiplexer, for amplifying the  
15 demultiplexed lights output form the demultiplexer; and

a plurality of beam splitters each disposed between the semiconductor optical amplifiers and the input ports of the multiplexer, for splitting the amplified demultiplexed lights into two parts, so as to provide the respective input ports of the multiplexer with a split part of the lights, while to transmit the other part of the lights out of the beam splitters.

20

2. The multi-wavelength light source unit as set forth in claim 1, further comprising an optical band-pass filter disposed between the input port of the

demultiplexer and the output port of the multiplexer, for passing to the demultiplexer the light signal only in a predetermined wavelength band of the multiplexed light signal from the multiplexer.

5           3.       The multi-wavelength light source unit as set forth in claim 1, further comprising optical isolator disposed between the optical band-pass filter and the multiplexer, for blocking the light signal component reflected to the multiplexer from the optical band-pass filter.

10          4.       The multi-wavelength light source unit as set forth in claim 2, further comprising optical isolator disposed between the optical band-pass filter and the multiplexer, for blocking the light signal component reflected to the multiplexer from the optical band-pass filter.

15          5.       The multi-wavelength light source unit as set forth in claim 1, wherein the multiplexer includes optical arrayed waveguide gratings having a planar lightguide circuit structure.

            6.       The multi-wavelength light source unit as set forth in claim 1,  
20 wherein the multiplexer includes an 1 x N optical coupler.

7. The multi-wavelength light source unit as set forth in claim 1, wherein the demultiplexer includes optical arrayed waveguide gratings having a planar lightguide circuit structure.

5 8. A multi-wavelength light source unit, comprising:  
a demultiplexer arranged to demultiplex a multiplexed light signal into a plurality of lights having different wavelengths;

a multiplexer arranged to multiplex the demultiplexed lights into the multiplexed light signal;

10 a plurality of semiconductor optical amplifiers arranged to amplify the demultiplexed lights output from the demultiplexer; and

a plurality of beam splitters arranged to provide at least a portion of one or more of the amplified demultiplexed lights to the multiplexer.

15 9. The multi-wavelength light source unit as set forth in claim 8, further comprising an optical band-pass filter arranged to pass to the demultiplexer the light signal only in a predetermined wavelength band of the multiplexed light signal from the multiplexer.

20 10. The multi-wavelength light source unit as set forth in claim 8, further comprising an optical isolator arranged to block the light signal component reflected to the multiplexer from the optical band-pass filter.

11. The multi-wavelength light source unit as set forth in claim 9, further comprising optical isolator arranged to block the light signal component reflected to the multiplexer from the optical band-pass filter.

5

12. The multi-wavelength light source unit as set forth in claim 8, wherein the multiplexer includes optical arrayed waveguide gratings having a planar lightguide circuit structure.

10 13. The multi-wavelength light source unit as set forth in claim 8, wherein the multiplexer includes a 1 x N optical coupler.

14. The multi-wavelength light source unit as set forth in claim 8, wherein the demultiplexer includes optical arrayed waveguide gratings having a planar lightguide  
15 circuit structure.